MULTIMEDIA UNIVERSITY®

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023 (TERM ID 2220)

ERE2036 ELECTRONICS INSTRUMENTATION

(All Sections / Groups)

5 JULY 2023
09:00 A.M – 11:00 A.M.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 6 pages including this cover page with 5 questions only.

2. Attempt all 5 questions. The questions have equal mark distribution. The distribution of marks for each question is given.

3. Please print all your answers in the answer booklet provided.

Question 1

(a) A variable DC power supply has a voltage setting of 5 V and a current setting of 0.1 A. Determine the range of load resistances for constant voltage operation.

[4 marks]

(b) A digital multimeter (DMM) uses an 8-bit analog to digital converter (ADC) with a reference voltage of 2.0 V.

(i) What is the voltage resolution at the 2V range?

[4 marks]

(ii) Explain how the DMM achieve the 20 V range.

[4 marks]

(c) Answer the following questions about digital frequency counter:

(i) Explain the role of gating time.

[4 marks]

(ii) Explain the fundamental difference between non-reciprocal and reciprocal frequency counters.

[4 marks]

Continued ...

Question 2

(a) Answer the following based on the digital storage oscilloscope display shown in Fig. Q2:

(i) Voltage per division
(ii) Time per division
(iii) Channel 1 maximum voltage
(iv) Channel 1 period
(v) Channel 2 phase relative to Channel 1 (indicate leading or lagging)

[10 marks]

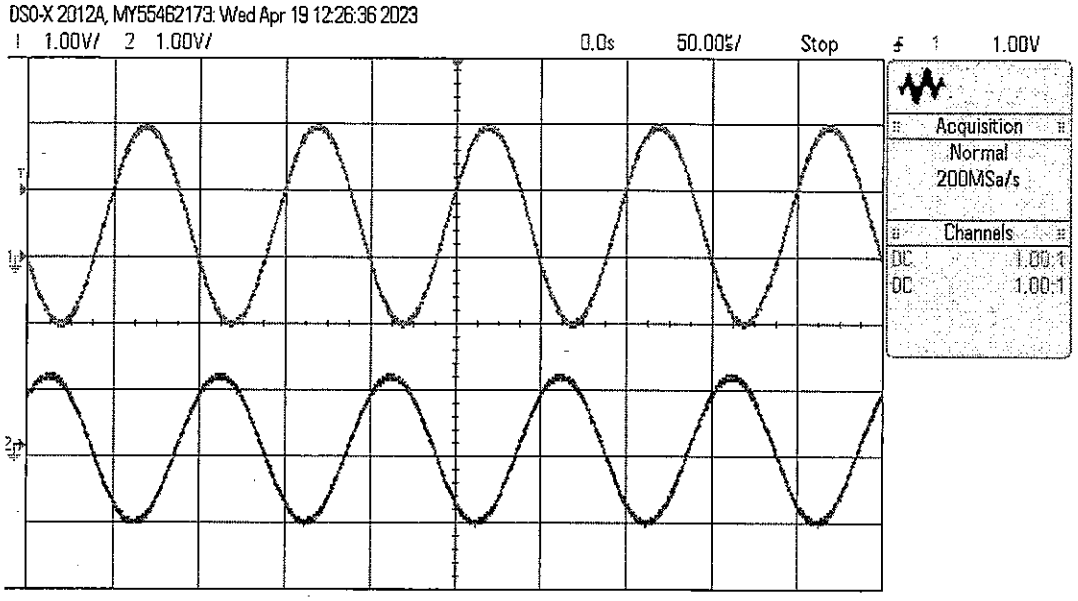

Fig. Q2

(b) Describe two effects of insufficient oscilloscope bandwidth.

[4 marks]

(c) An oscilloscope has an input resistance and capacitance of 1 MΩ and 15 pF. Draw a circuit model, including the component values, of a compensated 5× passive oscilloscope probe.

[6 marks]

Continued ...

Question 3

(a) Describe the differences between analog oscilloscope, digital storage oscilloscope, and mixed signal oscilloscope, in terms of the input channels, acquisition and processing.

[6 marks]

(b) Answer the following about oscilloscope trigger system:
   (i) Explain the role of trigger in oscilloscope operation.
   (ii) Describe the difference between Auto Mode and Normal Mode.

[6 marks]

(c) Describe 3 digital storage oscilloscope acquisition modes.

[8 marks]

Continued ...

Question 4

Fig. Q4 shows a simplified block diagram of a superheterodyne spectrum analyzer.

(a) Explain the functions of each of the following blocks.

(i) RF Input Attenuator

[3 marks]

(ii) IF Gain

[3 marks]

(iii) Sweep Generator

[4 marks]

(b) The input frequency range is from 10 kHz to 3 GHz. The first intermediate frequency (IF) is 5 GHz.

(i) Explain why an IF higher than the input frequency band is used.

[5 marks]

(ii) Determine the tuning range of the first local oscillator.

[5 marks]

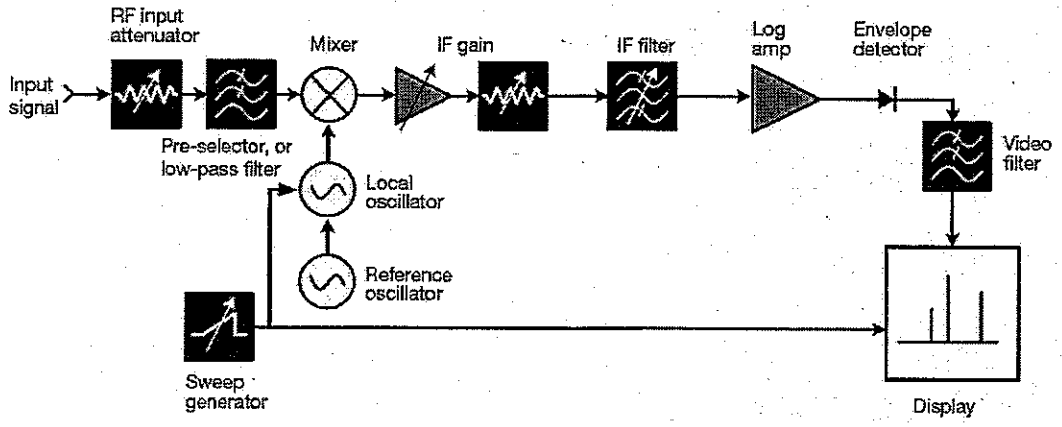

Fig. Q4

Continued ...

Question 5

(a) Determine the required center frequency and span settings to set the start and stop frequencies of a spectrum analyzer to 1 GHz and 2 GHz, respectively.

[4 marks]

(b) Describe 3 effects of decreasing the resolution bandwidth of a spectrum analyzer.

[6 marks]

(c) Sketch 2 spectrum analyzer's displays with differing video bandwidth to illustrate the effect of video bandwidth on the spectrum display.

[4 marks]

(d) With the aid of a diagram, explain the concept of bucket or bin for a spectrum analyzer with digital display. Hence, explain the sample detection mode.

[6 marks]

End of Paper